General anatomy and physiology

- Objective - Define anatomical terms with regard to function.
- Pseudocoelom - body cavity, fluid-filled under pressure so that worm can move when muscles contract. Movement is essential for nematode survival.
- Dorsal and ventral cords - major nerves. Target of many anthelmintic (deworming) drugs.
- Lateral cords - excretory system.
General anatomy and physiology

- Longitudinal section
- Cross section
- Movement inside host
- Movement outside host
General anatomy and physiology

- Digestive system: Buccal cavity with or without teeth.
- Well developed or vestigial.
General anatomy and physiology

- Esophagus: various forms identify larval stages and characterize families of nematodes.
  a. rhabditiform
  b. strongyliform
  c. filariform
  d. stichosome
General anatomy and physiology

• 3. intestine is a straight tube, no bends.

• 4. anus near posterior end.
General anatomy and physiology

- All nematodes in this course only reproduce sexually, except Strongyloides.
- Adult stage nematodes are male or female, not hermaphroditic like flat worms.
General anatomy and physiology

- Males, smaller than females, have copulatory bursa for grasping female and copulatory spicules for guiding sperm. Long, tubular, winding reproductive tract.
General anatomy and physiology

• Females have a long tubular reproductive tract opening to outside at a vulva that may be anterior, posterior or mid body.
Order Rhabditida: focus on the genus *Strongyloides*

- Exclusive to this nematode order: sexually reproducing **free-living stage** and parthenogenetic adult **parasitic stage**.

www.cdc.gov/dpdx/strongyloidiasis/
Order Rhabditida: focus on the genus *Strongyloides*

- Rhabditic mange – larval stages of free-living *Rhabditis strongyloides* penetrates skin
Order Rhabditida: focus on the genus *Strongyloides*

- Free living adults have rhabditiform esophagus
- Parasitic adults small, only adult females found in small intestine of host, long filariform esophagus
Order Rhabditida: focus on the genus *Strongyloides*

Females produce egg with $L_1$: hatches quickly (see $L_1$ in fresh feces of human and dog, larvated egg in other host species), Diagnostic importance? Pathogenic importance?
Order Rhabditida: focus on the genus *Strongyloides*

- Homogonic cycle - $L_1$ to infective (skin penetrating) $L_3$ within 24 hours. Autoinfection by skin penetration can lead to hyperinfection.
Order Rhabditida: focus on the genus *Strongyloides*

- Heterogonic cycle - $L_1$ to free-living adult females and males that produce more new $L_1$. Increases number of infective $L_3$ in environment (soil/bedding).
Order Rhabditida: focus on the genus *Strongyloides*

- Lactogenic route of infection.
Order Rhabditida: focus on the genus *Strongyloides*

- Skin penetrating route of infection.
Pathological lesions — *Strongyloides*

Enteritis response to adult females

Parasitic adult females

Lung reaction to migrating larvae
Pathological lesions – *Strongyloides*

- Larval migration to lungs in neonatal and young animals.
- Immunosuppressed adult host susceptible to hyperinfection and clinical signs.
- Otherwise the occurrence of clinical signs limited to neonatal and young animals.
Diagnosis and control: *Strongyloides*

- **Diagnosis:** eggs containing larva in fresh feces of most host species. Exception: in dog, cat and man $L_1$ are in fresh feces.
- **Mother infects newborn with milk containing $L_3$.** Mother will be fecal test negative. Babies will be shedding eggs or $L_1$. How does mother get infected?
- **Treat the babies to control the transmission.**
Treatment (FYI not on test): 
*Strongyloides*

- Macrolid anthelmintics (ivermectin, moxidectin, doramectin) used at dose to kill adult nematodes.
- Febantel for horses used at 50 mg/kg (almost 10x normal dose).
- Oxibendazole for horses at 15 mg/kg.
- The above dosage/drug information is FYI, not for testing.